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FLOOD INSURANCE STUDY

TOWN OF WORTHINGTON SPRINGS, FLORIDA

UNION COUNTY

AUGUST 4, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER 120594

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FLOOD INSURANCE STUDY

TOWN OF WORTHINGTON SPRINGS,
UNION COUNTY,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and supersedes a previous Flood Insurance Rate Map for the Town of Worthington Springs, Union County, Florida (Reference 1). This information will be used by the community to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, FEMA, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were obtained from the Flood Insurance Study for Union County, Florida (Reference 2).

1.3 Coordination

An initial consultation and coordination meeting to explain the nature and purpose of a Flood Insurance Study and to determine the areas to be studied in Union County, was held in Jacksonville, Florida, on January 29, 1985. Representatives of FEMA, the U.S. Army Corps of Engineers (COE), and the Suwannee River Water Management District (SRWMD) were in attendance.

A meeting with the SRWMD to discuss the preliminary findings of this study was held in Jacksonville, Florida, on June 11, 1986.

On September 16, 1987, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Worthington Springs, Union County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data.

Flooding caused by overflow of the Santa Fe River was studied in detail within the community.

2.2 Community Description

The Town of Worthington Springs is located in and surrounded by the unincorporated areas of Union County, Florida. Worthington Springs is about 15 miles north of Gainesville, Florida, and about 45 miles southwest of Jacksonville, Florida. State Roads 18 and 121 and the CSX railroad serve the town. Worthington Springs had a 1980 population of 220 (Reference 3).

The climate of Worthington Springs is semi-tropical, characterized by long, hot summers and mild winters. The average annual rainfall is 49.4 inches while the average temperatures vary from 55.9 degrees Fahrenheit (^{o}F) in January to 81.4^{o}F in August.

The town is in the Gulf Coastal lowlands physiographic area. The major fresh-water swamp association of soils adjacent to the Santa Fe River consists of nearly level, very poorly drained soils subject to prolonged flooding (Reference 4).

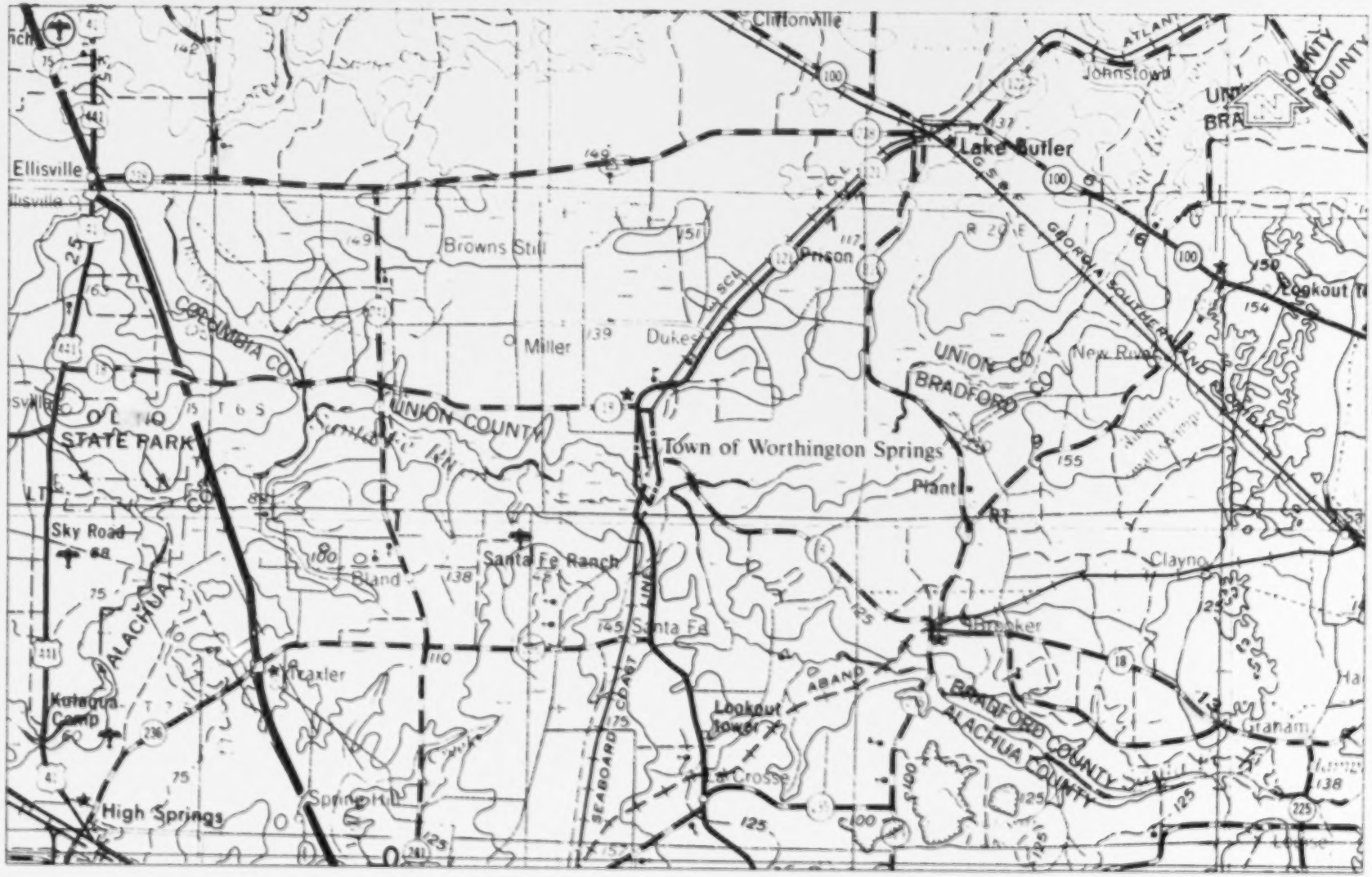


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF WORTHINGTON SPRINGS, FL
(UNION CO.)

APPROXIMATE SCALE

6 0 6 12 18 Miles

VICINITY MAP

2.3 Principal Flood Problems

The most severe floods in the Santa Fe basin are associated with storms or sequences of storms that produce widespread distribution of rainfall for several days duration. Flooding occurs in all seasons, but maximum annual stages occur most frequently from February through April as a result of a series of frontal-type rainfall events over the basin. The area is also subject to summer and fall tropical disturbances, occasionally of hurricane intensity. Thunderstorms caused by summer air mass activity produce intense rainfall, but the duration is usually short and aerial distribution is relatively small.

The September 1964 flood was the largest flood on the Santa Fe River. The discharge for the 1964 flood at the gage in the Town of Worthington Springs was 20,000 cubic feet per second (cfs). Discharges from the largest historical floods at the gage location in Worthington Springs are as follows:

HISTORICAL FLOOD DISCHARGES

LOCATION	PEAK DISCHARGES (cfs)				
	1934	1945	1947	1948	1964
SANTA FE RIVER at the Town of Worthington Springs	15,700	15,700	14,900	14,900	20,000

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The U.S. Geological Survey (USGS) has been monitoring flows in the Suwannee River basin since the flood of 1928. Each year, the USGS publishes the water resources data collected and periodically reports on the magnitude and frequency of floods. The information from these publications was used to perform the hydrologic analyses.

Analyses of discharge records of all gaged locations on the Santa Fe River were used to establish peak discharge-frequency relationships throughout the river reaches. Flood recurrence frequencies were determined by log-Pearson Type III statistical analysis in accordance with procedures recommended by the U.S. Department of the Interior (Reference 5). On the Santa Fe River, a rainfall runoff model was developed using the standard Soil Conservation Service procedure and the HEC-1 runoff model (References 6 and 7). The model was calibrated to the Hurricane Dora flood of 1964 and verified by statistical analysis of discharge records from four long-term gages on the Santa Fe River.

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
SANTA FE RIVER at the Town of Worthington Springs	630	12,824	20,748	25,162	36,500

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data were obtained from photography by aerial survey methods flown for the floodplain areas and by field measurements for the main channel and immediate overbanks (Reference 8). All bridges were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the HEC-2 step-backwater computer program (Reference 9). Roughness coefficients (Manning's "n") used in the hydraulic computation were determined by analyzing known flood events in the Union County reaches of the Santa Fe River. The Manning's "n" values used for the Santa Fe River calculations were 0.059 for the main channel and 0.31 for the overbank areas.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 10).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary

corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and the 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the Santa Fe River lie outside the corporate limits.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
SANTA FE RIVER								
A	259,723	1749	30,074	0.8	72.5	72.5	73.4	0.9
B	260,726	1792	29,035	0.9	72.9	72.9	73.9	1.0

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF WORTHINGTON SPRINGS, FL
(UNION CO.)

FLOODWAY DATA

SANTA FE RIVER

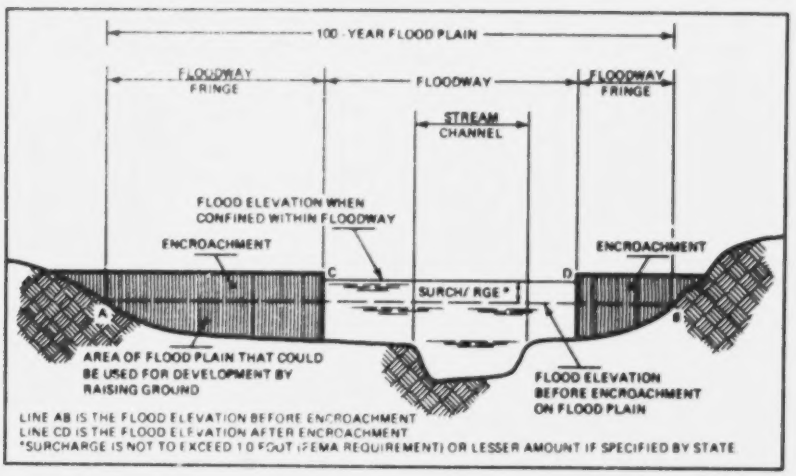

100 - YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Special Flood Hazard Information Report (SFHI) was prepared for the Suwanee River Basin, which includes the Santa Fe River in the vicinity of Worthington Springs (Reference 11). This study supersedes the SFHI.

Preparation of a Survey Review for the Suwanee River Basin, Florida, has begun (Reference 12). However, work has not progressed sufficiently to date to permit a comparison with the determinations contained in this report.

A Flood Insurance Study is in progress for Union County, Florida (Reference 2) and is in agreement with this study.

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously printed Flood Insurance Rate Map for the Town of Worthington Springs (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Rate Map, City of Worthington Springs, Union County, Florida, June 1986.

2. ————, Flood Insurance Study, Union County, Unincorporated Areas, Florida, in progress.

3. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Florida, Washington, D.C., February 1982.

4. Florida Bureau of Comprehensive Planning, The Florida General Soils, Atlas, July 1975.

5. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

6. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release No. 20, Computer Program for Project Formulation, Hydrology, May 1965.

7. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, Computer Program 823-X6-L2610, Davis, California, January 1973.

8. ————, Jacksonville District, Stream Cross Sections, Southern Resource Mapping, Ormond Beach, Florida, compiled by photogrammetric methods from aerial photography, October 1985.

9. ————, Hydrologic Engineering Center, Generalized Computer Program HEC-2, Water-Surface Profiles, Davis, California, November 1976.

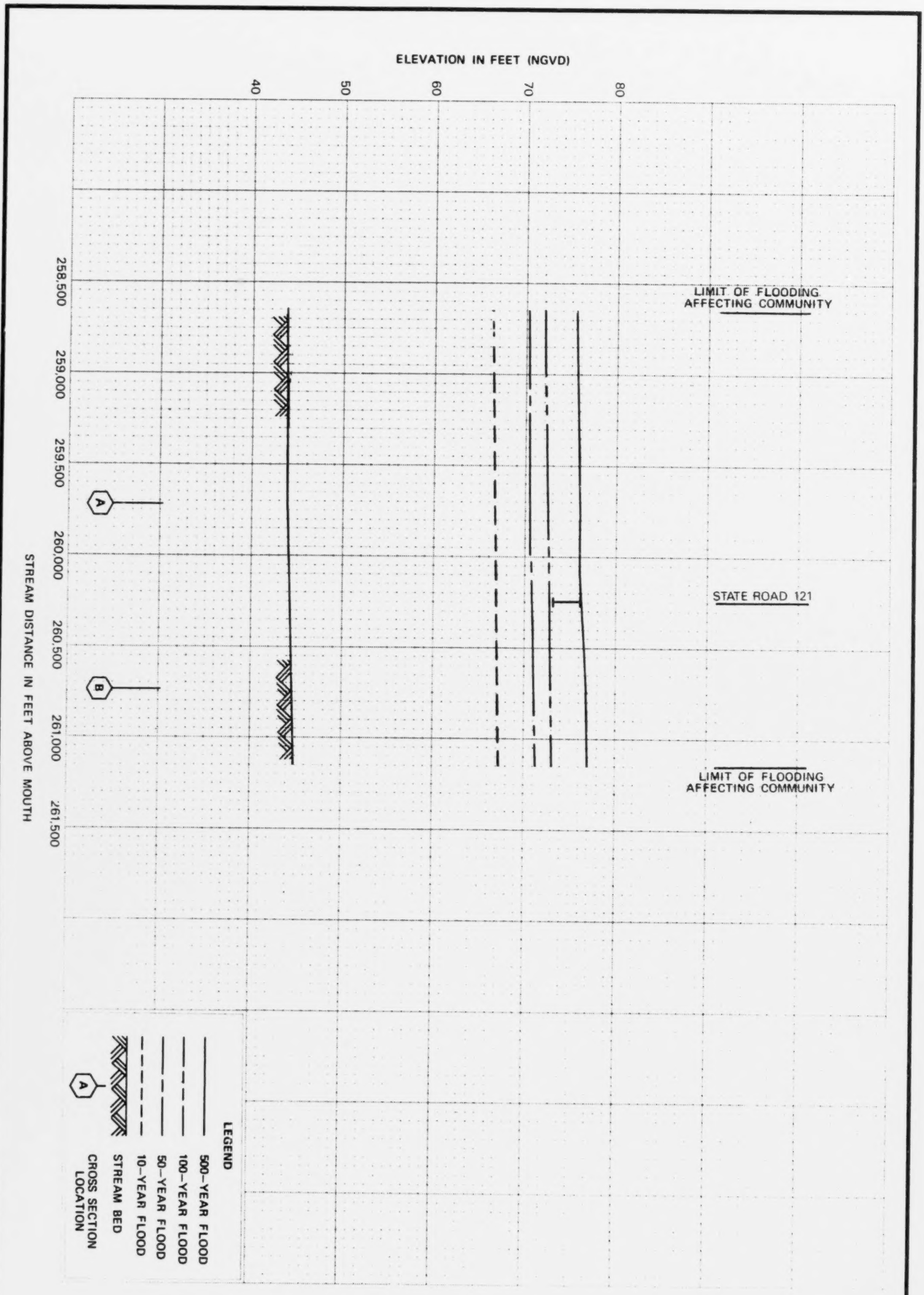
10. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 feet: Worthington Springs, Florida, 1966.

11. U.S. Army Corps of Engineers, Jacksonville District, Special Flood Hazard Information, Suwannee River Floods, Florida and Georgia, December 1974, reprinted February 1983.

12. ————, Jacksonville District, Survey Review, Suwannee River Basin, Georgia and Florida, ongoing.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0001	74.19	Florida Department of Transportation disk set on northeast side of State Road 121 bridge over the Santa Fe River



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01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **TOWN OF WORTHINGTON SPRINGS, FL** (UNION CO.)	**FLOOD PROFILES** **SANTA FE RIVER**